Office of Air Quality
FACT SHEET
(800) 451-6027 www.IN.gov/idem September 2006

Air Quality Impacts of Biofuels

What are Biofuels?

The two major types of biofuels in Indiana are Ethanol and Biodiesel. Ethanol fuels are manufactured by blending 100% grain alcohol (usually made from corn) with conventional petroleum-based gasoline. In Indiana today, approximately 75% or the gasoline sold contains around 10% ethanol by volume; this is known as E10. Most vehicles on the road today can run on E10 without modification. However, there is growing interest in the positive effects of E85, a blend of 85% ethanol with 15% conventional petroleum-based gasoline. Vehicles marketed today and labeled "flex fuel" can run using any blend of Ethanol up to and including an E85 blend.

Biodiesel is most commonly produced by blending a soybean oil-based product with conventional petroleum-based diesel fuel. These blend ratios can range from 2% to 100% Biodiesel (B2 to B100). The most common blend rate for Biodiesel is a 5% or 20% blend of Biodiesel with conventional petroleum-based diesel fuel (B5 or B20). Any diesel engine can use Biodiesel fuels regardless of the blend rates. In the case of either Biofuel option, it is always best to consult your owner's manual for the manufacturer's recommendations or warnings.

What effect does the use of biofuels have on ground level ozone, sulfur dioxide and fine particle pollution?

Blending ethanol with gasoline reduces tailpipe emissions. When used in non- "flex fuel" vehicles, some characteristics of E10 (such as hydrocarbon vapor evaporation and permeation) can result in minor increases in emissions that can contribute to ground level ozone. The total change in emissions from the use of E10 is not expected to affect the state's ability to attain and maintain compliance with any of the health-based air quality standards.

Because "flex fuel" vehicles are specifically designed to use up to an E85 blend of ethanol, emissions that contribute to ground level ozone, sulfur dioxide and fine particle pollution all decrease by significant amounts compared to conventional petroleum-based gasoline or E10. As a result, E85 has a significant environmental benefit that could become a voluntary component of Indiana's plan to comply with health-based air quality standards.

The use of Biodiesel fuel reduces sulfur dioxide, fine particles and unburned hydrocarbons, with a slight increase in oxides of nitrogen. Hydrocarbons and oxides of nitrogen contribute to ground level ozone formation. Sulfur dioxide, fine particles and oxides of nitrogen contribute to particulate matter (fine and coarse). The emission reduction benefits (sulfur dioxide, hydrocarbons, and fine particles) attributable to the use of Biodiesel could be locally significant in areas where there are a large number of diesel vehicles operating, such as truck stops. Although there is a minor oxides of nitrogen disbenefit, the reduction benefits outweigh the disbenifits and the overall impact of the use of Biodiesel is not expected to affect the state's ability to attain and maintain compliance with any of the health-based air quality standards.

Additional environmental benefits associated with biofuels:

Benzene - Benzene is a component of conventional gasoline and is a carcinogenic hazardous air pollutant. In most areas, the majority of the benzene in the ambient air comes from the use of petroleum-based gasoline. As the percentage of ethanol in gasoline products increases, there is an associated reduction in benzene emissions.

Methyl Tertiary-Butyl Ether (MTBE) – In the late 1970's, as "leaded" gasoline was being phased out, MTBE was incorporated into gasoline products as an oxygenate to help gasoline burn more completely, thereby reducing emissions. However, in the mid 1990's MTBE began showing up in ground water and an associated health risk was identified. In the late 1990's and early 2000's MTBE was replaced with Ethanol in areas where Ethanol was readily available. Ethanol provides the same beneficial characteristics as MTBE in gasoline, but poses much less risk to soil, groundwater, and public health.

Greenhouse Gases – Biofuels, in general, are greenhouse gas-friendly. Since more carbon is taken out of the air when the crops are grown than are emitted when the fuel is burned, there is a net benefit.

Tables 1 and 2 below indicate the overall air emission effects of the use of E85 and B20 as alternative fuels in Indiana.

Table 1 - Ethanol

Indiana Statewide Onroad Emissions[1] and Criteria Air Pollutant Effect of E85 Use Statewide (Tons per Year From All Onroad Gasoline Sources)				
	Total VOC	Total NOx	Total PM	Total SO2
Baseline Fuel (100% conventional petroleum-based gasoline)	120,806	111,511	1,408	6,650
E85[2] (Percentage Change in Emissions)[3]	-15%	-10%	-20%	-80%
E85 (Effect in Tons per Year)	-18,121	-11,151	-282	-5,320
Indiana Statewide Mobile Emissions (Including Onroad and Nonroad Sources) (Tons per Year)	178,483	318,122	11,591	18,893
Indiana Statewide Total Emissions (All source categories in Tons per Year)	369,759	715,688	152,116	1,014,160

Table 2 - Biodiesel

Indiana Statewide Onroad Emissions[4] and Criteria Air Pollutant Effect of B20 Use Statewide (Tons per Year From All Onroad Diesel Sources)				
	Total VOC	Total NOx	Total PM	Total SO2
Baseline Fuel (Traditional Diesel Fuel)	5,852	100,522	2,938	3,117
B20[2] (Percentage Change in Emissions)[5]	-21%	+2%	-10%	-20%
B20 (Effect in Tons per Year)	-1,229	+2,010	-294	-623
Indiana Statewide Mobile Emissions (Including Onroad and Nonroad Sources) (Tons per Year)	178,483	318,122	11,591	18,893
Indiana Statewide Total Emissions (All source categories in Tons per Year)	369,759	715,688	152,116	1,014,160

Note: Positive Values Reflect Emissions Increase.

[1] Source: Indiana Department of Environmental Management's 2002 onroad emissions inventory.
[2] Emission reduction benefits range based on engine make and model. Once combined with cleaner petroleum-based fuel, engine advances, and other control technologies, the emissions reduction potential of E85 and B20 could be greater.
[3] Source: U.S. EPA Fact Sheet EPA420-F-00-035.
[4] Source: Indiana Department of Environmental Management's 2002 onroad emissions inventory.
[5] Source: A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions - Draft U.S. EPA Technical Report Issued October 2002.